HINTS TO INVENTORS

BY AN EXPERT

"INVENTIONS. THE WORLD YET NEEDS"

FROM – THE NEW YORK TIMES.

THESE Little Booklets are printed for the Information and Instruction of Inventors in the things they ought to Know. They do not put up a Vociferous Appeal for Business. But those who read them Carefully will know more about us.

G. & M.

THE author of the following "Hints to Inventors" has had a thorough legal and scientific training and a wide experience with inventors and inventions, as counsel, expert, operator and manufacturer. He is fully qualified to give sound advice on the general subject, and has a practical working knowledge of many of the arts he touches upon. He is not a member of this firm.

In circulating his suggestions and the interesting additional matter taken from the "New York Times," it is not the purpose of this firm to advise its clients in detail "What to Invent," or to stimulate a rush of applications for patents on unmatured inventions, but to keep the former abreast of actual demand and actual progress, and in touch with the best thought and the broadest observation that are now being given to the general subject, to help them to avoid unprofitable lines of invention, and to extend the reputation of this firm for devotion to the interests of its clients and sound and helpful counsel.

It is not to be assumed that these suggestions cover the field. Others will be published from time to time hereafter.

GREELEY & MCINTIRE.

HINTS TO INVENTORS

Waste—How to Avoid it.

One of the objects sought by invention is saving, the elimination or reduction of waste—waste of power, labor, material or product. A useful thing for the inventor to know, and know thoroughly, is to avoid waste himself—waste of energy, time and inventive skill. The importance of knowing the conditions he desires to meet, the exact improvement needed, the probable demand, whether large or small, can not be overestimated, and counts heavily toward the result. The more he knows of recent improvements in his proposed line of invention the better.

Misdirected Invention.

The Patent Office records show innumerable cases of misdirected invention, some of which indicate a high order of mechanical and inventive ability, dead before they were born, by reason of the inventor's misunderstanding of conditions or by reason of limitation of demand or *total lack* of necessity or demand for the invention, all of which could have been foreseen or discovered in advance by the inventor.

Study of Conditions.

The study the inventor gives to the industry in which his proposed invention is classed, to the actual conditions under which, when embodied in a machine or process, it must do its work, to the important factors of cost and demand, is never wasted. This is just as important, whether the invention is to be an improved flatiron or a piece of textile machinery.

Sources of Successful Invention.

It is a fact that a large percentage of practically successful inventions, especially among those which have been readily introduced and have become quickly profitable to the inventor, have been made by men familiar through their daily occupation, or through daily contact, with the line of industry to which their improvements applied; though this is not a universal rule, as some of the most valuable inventions have been made by men with comparatively little experience in the art in which they subsequently became famous. Edison is a case of one kind, and Bell, of the telephone, of the other, though it is noticeable that long study of the conditions and the problem seem to have preceded Prof. Bell's invention.

Chance and Opportunity.

Here and there chance and opportunity have a good deal to do with invention. Much has been done by men who, without much previous familiarity with the art or line of invention, have kept their eyes open. Quick observation goes a long way.

This is especially true of many minor inventions, some of which have resulted in large profits.

Discovery.

Some discoveries, like the vulcanization of rubber, are not the result of study and inventive genius on the part of the inventor, but of pure accident. In that case Goodyear, of course, had the desired result in mind, so that he was able instantly to seize upon and mentally apply the accidental discovery. This instant application of a discovery to a need, deficiency or demand, previously in the mind of the discoverer, is entitled to all the credit of pure invention, and in the law is held to be equivalent to it.

Study of Practical Needs.

General study and review of the great practical needs in various arts is of value. It tends to stimulate what may be termed intelligent invention, the kind of invention in which thought precedes imagination, the inventive act itself having been more than once characterized by the Federal Courts as an act of the imaginative faculty.

Purpose of These Hints.

It is the hope of the writer that the suggestions embodied in the paragraphs which follow may be of value in just the above direction. They are intended merely as suggestions, to stimulate thought on the subjects noted, which are very briefly touched upon. There is no attempt to cover the whole field of invention, or in fact any very large portion of it.

Testing Inventions.

Wherever possible, the invention, unless it is a simple article or a very obvious improvement involving little mechanism, should be practically tested. In a large number of cases, however, this, for various reasons, is impracticable.

Disclosure—Witnesses to Priority.

Disclosure should be made, as a rule, only to persons who can be thoroughly trusted. It is right at this point, when the inventor has completed his model or sketch so the invention can be seen and understood, that the misappropriation of the invention usually takes place, when it takes place at all. On this point the inventor frequently finds himself in a dilemma. For purposes of proof as to priority of invention, which it may be necessary to offer either in an interference between two applications in the Patent Office, or in the progress of an infringement suit, the production of models, sketches or completed apparatus and their identification by reliable witnesses as having been shown them at a date prior to the application, are often of the greatest importance to the inventor, as establishing the actual date of his completed invention. Therefore on this point the inventor must exercise great care and good judgment. There is such a thing as being too secretive.

Disclosure to Attorneys.

Eventually, and before application, the invention usually must be disclosed to a patent attorney. It is inadvisable for the

inventor to act as his own attorney, although he has that privilege.

No Risk in Disclosure to Reputable Attorneys

It may be stated here that breach of confidence on the part of the attorney, the betrayal of the inventor's secret, is infrequent. It has occurred, especially in cases where the interests involved were large and the attorney dishonest enough to take advantage of such conditions. But such instances are extremely rare, and never occur among attorneys of standing and repute. A busy patent attorney early acquires the habit of looking at an invention, however valuable, simply as subject matter to be dealt with on purely professional lines, just as a sub-treasury cashier learns to regard the enormous amounts of currency which pass through his hands merely as so much merchandise or goods, feeling no interest in it, except as a miscount or an error in entering up may affect his balance.

Misunderstanding of Claims.

Few inventors really understand the nature of a claim. A competent and highly intelligent but inexperienced inventor once pointed out to the writer the fourteenth claim of an allowed application as the best one of the lot, congratulating the attorney on having secured it. The claim in question was almost as descriptive in detail as the specification itself. It included every element in the mechanism. It was therefore the narrowest claim of the whole fourteen and the least valuable.

Claims Not Difficult to Read.

There is no mystery about reading claims, and no difficulty in understanding what they cover.

A General Rule for Reading Claims.

A good general rule is that the *smaller* the number of elements contained in the claim, the *fewer* the steps detailed in a process claim, the *fewer* the parts detailed in a mechanical claim, the *fewer* the substances detailed in a claim for a composition of matter—the *broader* the claim and the better it protects the invention.

Worthless Claims.

If in a claim there are five elements or parts, and one of these can be dispensed with or replaced by another element, not under the law a "mechanical equivalent," without affecting the product of the process, the operation of the mechanism or the useful characteristics of the composition of matter, the claim, though it may be allowed, is absolutely worthless. Yet the attorney who prosecutes applications on a contingent fee would without doubt claim his fee in such a case, having secured a patent, though a worthless one.

Another General Rule.

An Apparently Narrow Claim May Protect.

To simplify the matter still further it may be said, with a good many exceptions, that the *shorter* the claim the *broader* the protection, and conversely, the *longer* the claim the *less* protection. If, however, the claim contains a number of elements, and any one of them, or the combination of all, is absolutely essential to the improved result or the improved operation, the invention is to all intents and purposes well protected.

Study these Rules and Protect Yourself.

It is suggested that the reader study the simple rules above stated with reference to the claims of a few patents with which he has thoroughly familiarized himself, and apply them to the claims, bearing in mind that in the majority of cases the broadest claims come first in order. If he does this thoroughly (and it is by no means a difficult undertaking), he will have a better understanding of what really good soliciting work is, and will be less likely to be fooled by unscrupulous attorneys, who are apt to get him any kind of an allowance and drop the case. He will be, perhaps, less inclined to send his applications to big "patent foundries," not under the close supervision of trained and skillful attorneys with a professional record to maintain.

Selection of an Attorney.

Not of the least importance is the selection of a competent, skillful, faithful and persistent attorney, whose record in doing business for other people, particularly the sort that are likely to be careful in the selection of their attorney, is such as to warrant the belief that he will stick to the application until he gets the very broadest protection that the Patent Office can be induced to give.

Failures Through Bad Selection.

Some of the most unexpected and utter failures made by inventors in realizing on their work have resulted from carelessness or over-economy in the matter of attorney's work, or from misplaced faith in catch-penny advertisements.

Importance of the Attorney.

A good attorney is one of the main factors in the inventor's practical success.

Some Lines of Industry

IN WHICH THE

Inventor is Needed

Fuel.

The development of the coal deposits in Alaska and China will probably uncover the last of the great sources of coal supply. New oil fields may be found, but the world, except in a few not extensive regions, has been pretty well prospected for oil. We can see a time coming when the world will be facing the consequences of a steady diminution of its fuel supply. The situation must be met in advance by invention and discovery, and it is altogether likely that it will be. People who out of their great wisdom (and a desire for attorney's fees) tell the inventor in detail what to invent, have given inventors a false, or at least mistaken, lead on the fuel question. The solution is not likely to be found in any "fuel compound." It may be rash to predict that no "fuel compound" containing neither coal nor any of the hydrocarbon oils will ever be invented or discovered, but it is by no means probable.

The progress of electrical science and invention, of which Edison says that we are standing merely on the edge, may assist materially in the solution of the question. The discovery of natural forces now unknown may help to answer it, as the dis-

covery of the Hertzian waves and their laws, or a part of them, brought about wireless telegraphy. It is probably in such directions that most is to be hoped for.

These suggestions are directed to the inventor who seeks profit from his work, the more immediate the better. The broadest lines of discovery are not for him. They are for the scientist who seeks his reward in achievement and not in cash. The discovery of a new law of nature would not be patentable. The discoverer could protect only mechanisms and processes based upon it; in other words, only its applications, so far as he could make them.

The best field for the inventor, in this connection, is in fuel economy, in conservation of heat produced, in its more economical and effective application, and generally in getting better results from it. In these directions there is still a vast field open to invention, holding out to the inventor almost innumerable possibilities of profit.

Conversion of Heat into Power.

From 85 to 93 per cent of heat energy developed by the use of fuel is lost in the conversion of heat into power, with a corresponding waste of fuel. Any invention that reduces this enormous waste, even in a slight degree, will find a world-wide market.

It is believed by such authorities as Thomas A. Edison that we shall see the time when the electric current will be produced directly from heat. Inventors all over the world are working on methods and apparatus intended to produce this result. But minor and less radical inventions which economize heat energy, no matter

where in the combination of engine and boiler they may be applied, from the fire box to the exhaust, are worth money.

Combustion.

A varying but always large percentage of fuel used is wasted, not being actually consumed at all, or consumed at the point where the heat generated is not effective for the desired purpose. A great deal has been done in this direction, as witness the difference in fuel economy between the iron furnaces of fifty years ago and those of today. A very great deal yet remains to be done before anything approaching an ideal condition is reached.

All this means money, not to one inventor in one special line, but to many inventors in the various industrial lines in which there is a large use of fuel for generating heat.

One of the main things to be aimed at is complete combustion of the fuel at the point where it will get the best practical result.

Smoke.

Smoke means dirt, discomfort and injury to health, spread usually over an area largely occupied by people who are not directly benefited by the industries which create it. It is an unmitigated nuisance, defiling and defacing cities and towns throughout the whole soft coal consuming region of the country, which otherwise could, and in many instances would, be kept reasonably clean. It is idle to pass "soft coal" or "smoke" ordinances, if they are not enforced, and they can not be made

enforcible without the inventor's aid. It is only a question of time when soft coal must be used on all railroads and in all fuel using industries in the East, as well as in the rest of the country. Moreover, smoke means waste, and a tremendous waste at that, waste of the unconsumed carbon of which it is in part composed.

Processes and apparatus have been invented and are here and there in use, which do to a large extent prevent smoke. A number of so-called smoke consuming devices are effective to an extent. Manufacturers, however, claim that they are all alike uneconomical, that they occasion more waste than they prevent. This is a condition that can be met, and it is certain that it will be. When an inventor produces a process or apparatus, or both combined, that consumes smoke, or prevents it, and that at the same time through perfect combustion prevents the waste and does not substitute one form of waste for another, the returns to the inventor will be very large. There is a fortune in this for a good many men.

Gas Economy.

Gas "checks" or regulating devices intended to secure a uniform pressure at the tip of the burner, and to prevent excessive pressure, thereby securing better combustion, have been produced in considerable numbers. The main difficulty encountered by the best of these is the clogging or "gumming" of the regulator by the heavier constituents of the gas. A way should be found to avoid this. A gas regulator not open to this objection should have some value.

The waste in gas consumption is due to

imperfect combustion. This is true in the case of natural gas in a very high degree. The greatest saving to be effected by an invention in this line will naturally be in the direction of producing more nearly perfect combustion in the burners in which natural gas is used for heating and cooking, the quantity so used and the proportion now being wasted being greater than in the case of illuminating gas.

The saving that can theoretically be effected in these lines is very great, and devices and apparatus intended for this purpose will sell readily on demonstration. Moreover, demonstration of the actual working of the device is easy and inexpensive.

Condensation in Steam Cylinders.

There is a distinctly appreciable loss of power in any condensation of steam before it reaches the exhaust. A good deal of this occurs in the steam cylinder. In the theoretically perfect boiler and engine there would be no condensation, and no use for steam traps. This theoretical result, of course, never can be actually reached, but it is well to keep it in mind. Convenient means for decreasing condensation increase power and efficiency. That is worth money wherever a steam engine is used. No one needs to be more than reminded of the great value of a successful invention in this line.

"Scale" in Boiler Tubes.

This is an incrustation supposed to be produced by the deposition of the mineral constituents of the water used, on the inside or the outside of the tube, according

to the nature of the boiler, whether of the water-tube type or otherwise. The obvious effect of "scale" is to waste more and more fuel as the "scale" thickens. The immediate objects sought by inventions in this line differ. Some aim to prevent the "scale," and others to render it readily removable. One result or the other is sought by the many "Boiler Compounds" in the market. What are probably the best of them do not materially prevent the deposition of "scale," but cause it to deposit in a hard, thin layer, which comes away from the boiler tube or the inside of the boiler clean and is easily broken up by a light hammer stroke on the metal itself; but there is a great deal of room for improvement in either direction mentioned. An improved "Boiler Compound" will probably be inexpensive to manufacture. None of the present compounds are costly.

The field is large. A successful invention in this line, one that really gives results, will be easy to demonstrate, and the profit to the inventor should be considerable.

Lubrication of Compression Cylinders.

Refrigerating machines, locomotive air pumps and all machines using compression cylinders require a better method of lubricating the piston and the interior wall of the cylinder. The interior, of course, cannot be gotten at during operation, which is just the time when trouble occurs. Unlubricated, or "dry," the friction between the piston head and the wall of the cylinder is wearing both with every stroke. If this is kept up for a short time it means a new piston head slightly larger than the old one, as packing, under many circumstances, can not be used. In many cases,

as for instance in breweries, where compression cylinders are used to increase carbonic acid gas pressure for charging beer, and in nearly all types of ice machine compressors, any lubricant that imparts an odor to the gas can not be used, glycerine being frequently used as a lubricant in such cases. The feeding apparatus must distribute the lubricant from the interior of the cylinder on the down stroke of the piston. And the feed must be automatically regulated. Also the lubricant must enter the piston under the right pressure. No feeding mechanism now made for this purpose meets all requirements.

A device that will be automatic, effective, and not too high in cost, and that can be readily adjusted to the compression cylinder, will find a market at a price that will pay the inventor. In this case, also, the successful inventor will not need much money in order to get his invention thoroughly tested, or to get it to a profitable market thereafter.

Lubrication in the Cylinders of Gas Engines.

This is a very different proposition from the last. The problem to be met involves other factors and conditions. The main difficulty arises from the high temperature created by rapidly succeeding explosions. If the interior of the cylinder and the portion of the piston head in contact with its interior wall are wholly unlubricated, wear and consequent waste caused by the loose fitting piston head obviously result. A lubricant that can be well distributed over the interior wall of the cylinder on the down stroke of the piston, and that would not be rapidly consumed, as the hydrocarbon oils invariably are, would be a discovery of great value. There is also

room for apparatus invention in the way of improved means for applying the lubricant.

Given a thorough understanding of the conditions and the difficulties, study and successful invention in this line should prove highly profitable to somebody, and probably will.

Automobile Inventions.

The automobile and the manufacturing industries resulting from it have brought into demand and ultimately into use a number of inventions which have proved profitable, some of them very highly so. There is today a demand for improvements in automobile construction, as well as in the construction of necessary features and attachments. The machine still needs lighter construction without loss of structural strength, devices for taking up shock, and diminishing or taking up vibration, increased simplicity of construction and operation, and inventions of many kinds adapted to make it more "fool-proof." It is always calling for improvements in minor details.

Mr. J. M. Hill is authority for the statement that automobile sales for 1910 will reach the stupendous total of $400,000,000 in this country alone.

Repairing Punctures in Pneumatic Tires.

Somebody ought to produce a cheap, convenient and effective means for repairing a punctured automobile tire on the road, without winding the tire with tape as at present, which latter is always unsightly and often ineffectual. Preferably the device should not hold itself, or be held, against the pneumatic pressure from the inside of the tire, but should have that pressure back of it; in other words, should be held in place, or reinforced, by the pneumatic pressure itself.

Carburetters.

So long as the exhaust of an automobile engine has the familiar odor of partly burned gasoline and leaves behind it a distinct and unpleasant trail, combustion is incomplete; in other words, the gasoline is not doing its full work, is in part wasted, the waste being converted into smell instead of power. This incomplete combustion is usually traceable to the carburetter. The carburetter has been aptly said to be the heart of the machine. Theoretically the carburetter admits the gasoline in proper quantity and at the proper rate, air likewise, mixes the two in such proportion that there will be just sufficient air combined with the gasoline to insure perfect combustion, and delivers the mixture to the engine. Here is where trouble occurs.

The carburetter must be capable of manual adjustment, but must operate automatically as to intake of gasoline and air, and mixture and delivery. The proportions must be right, the mixture complete, and the delivery at a given speed uniform. The conditions are simple and easily understood, yet somehow they never seem to be perfectly met. There is still a good deal of waste through imperfect combustion, and new carburetters designed to overcome it appear from time to time.

A number of types of carburetter are in use, some of them on many thousand machines. Practically all of them are patented. Some are manufactured and sold to automobile manufacturers, some are manufac-

tured by automobile concerns on royalty, and in other cases the automobile concern itself owns the patent. Carburetters sell at from $10 to $50. One of the best the writer has seen costs $3.25 to manufacture and sells for $12.

A carburetter that will save one-half of the gasoline now wasted per horse power developed, and that is well protected by a patent or patents intelligently taken out through competent attorneys, is worth a fortune, and its inventor will realize one.

Spark Plugs.

The great improvements made in explosive engines and the extended field for their use have necessarily stimulated improvements in spark plugs, which are employed in the ignition of the gas in the explosion chamber.

It is of the highest importance that the spark plug should not fail to produce an igniting spark accurately and constantly. This is necessary in all stationary and automobile engines, but in engines used in flying machines it becomes a vital matter. Failure of ignition at critical moments means the danger of a serious and often fatal accident. This field has been explored to some extent, but there is still a very large margin for inventive ability. The inventor who produces a spark plug that is absolutely reliable, that never fails to "spark" accurately and continuously, and who properly protects his invention, has a reasonable assurance of a fortune.

Storage Batteries.

Mr. Edison several years ago invented and has since put in practical shape a storage battery of two or three times the efficiency of the old storage battery of equal weight. With his usual frankness he says that this is not by any means the last word in storage batteries; that his battery is capable of improvement, and that a good deal is to be looked for in the future from the work of others.

One of the uses for an improved storage battery is in the power houses of traction companies, in getting over what is known as the "peak," which calls for extra power when the great strain comes on the generating apparatus during the "rush" hours in the morning and at the close of the day. A storage battery that can be operated with minimum leakage and that effects distinct economies in operation would be in demand for storing up power during the less active traction hours for use in getting over the "peak." A further improvement in storage batteries would be in broader demand as adapting the storage battery and electric motor to wider use in wheeled vehicles of all kinds. A clever and successful electrician, himself an inventor of ability, once remarked to the writer that the time would come when we should buy current for household use in light storage battery cells delivered and exchanged at the door like full and empty bottles of milk.

Extermination of Flies.

The common house fly was once regarded as a harmless nuisance, and by many scientific men of fifty years ago was looked upon as a useful scavenger, consuming matter that would otherwise become dangerous to health.

We know better now. We as children were forbidden to wantonly take the life

of the "harmless, innocent" fly. This innocent is now known to be one of the most deadly enemies of the human race. It is an active germ carrier and therefore a means of infection in the case of substantially all diseases the poison of which enters the system through the mouth and alimentary canal. In the typhoid chart kept by the New York Board of Health the line begins to rise soon after the opening of the fly season in May, and continues very far above average until some time after freezing weather sets in, its continuance for a time thereafter being caused by infection which has taken place before the disappearance of the fly.

The only practical remedy so far devised has been the covering of stable refuse and other decaying matter in which the fly deposits its eggs with wire gauze. General employment of this method is difficult in itself and difficult of enforcement, even by the most active sanitary squad. Some more effective means, more easily employed and capable of better enforcement, is urgently needed. It is not too much to say that, universally adopted, it would materially increase the average term of human life.

Neither is it too much to say that a successful method of extermination, chemical or mechanical, would be welcomed by the health authorities of cities and towns throughout the country, and, given reasonable cost, would be widely adopted.

Insect Pests Generally.

The mosquito problem has already been dealt with more or less successfully. In the main the treatment consists in the spraying of all standing water in the neighborhood with raw or refined petroleum,

which forms an infinitesimally thin scum on the surface, and kills the larvae, which move freely in the water, when they come to the surface, as they must. The protection of a whole neighborhood by this means is somewhat expensive, and no standing water whatever can be overlooked with any certainty of success. Mosquitoes will breed in a half empty tomato can. There is room for improvement, even in this method, which has once at least, however, in the hands of our military medical staff, proved itself thoroughly efficient, the mosquito having been once practically exterminated in the city and environs of Havana. Something that has greater convenience of application is needed.

Crop losses from the "Green Bug" and the "Chinch Bug," which attack, at different periods of growth, wheat and other cereals, mount into the millions annually. Other insect pests which attack other crops, for instance potato plants and fruit trees, also cause a great annual loss.

These conditions offer an opportunity to the inventor to effect a saving on a very large scale, with a corresponding return to himself.

Agricultural Inventions.

Farmers all over the country are getting rich. That means that the demand for improved mechanism for farm use, which to an extent will supersede manual labor, is on the increase. Another factor in the demand for such improvements is the growing scarcity of farm labor. In the more productive areas, especially in the farther West and in the irrigated lands, a farm laborer who is good for anything has a chance of becoming a proprietor in a small way within a few years. When he

gets to that point, he quits his job. But the bulk of farm labor obtainable, even under the fair wages and more healthful conditions that the farm offers, is of poor average quality, in the South of the very worst. Any invention that enables a farmer to dispense with one or two inefficient hands, that decreases the cost of his product, will find a quicker and very much wider market than that of ten years ago. Also, aside from plows, fencing and harvesting machinery, and notwithstanding all the agricultural inventions for which patents have issued, less, on the whole, in the last fifty years has been accomplished by the inventor for the farm than for other great industries.

Some of the later developments in agriculture call for special inventions. The sugar beet industry, for instance, needs harvesting machinery.

Light ditch digging, planting, cultivating and harvesting machinery reduced to one mule power, that would be practical and labor saving, would find a ready market on the small irrigated farms in the West, the number of which is increasing day by day.

Cotton Picker.

The entire cotton producing area is cursed with a bad labor system, and the most inefficient and unreliable labor to be found in any civilized country in the world. The crop in this case must be picked on time. Serious financial loss may result from neglect. If this work could be done by machinery operated by skilled white labor, the prosperity of the States in the "cotton belt" would be materially increased. An invention which really solves the problem would be widely adopted, and

the planter could afford to pay a good round figure for a machine which would make him independent of negro labor in the cotton picking season.

The money which Eli Whitney might have made, but did not make, from the cotton gin, would be exceeded many times by the returns from a practical cotton picking machine.

The production of such a machine presents no insuperable obstacles, when we consider the development in other lines of agricultural machinery and in machinery which handles the products of agriculture. Every one is familiar with the McCormick reapers and binders, but not every one may know that there are machines in wide operation in the canning industry which take green peas, vines and all, into the hopper and turn them out shelled, cleaned, and ready for the can, a different invention, of course, but one that twenty years ago would have been regarded as wholly impossible.

The cotton picker is coming. There is a way, and some inventor who familiarizes himself with the exact conditions under which such a machine must operate, is sure to find it; with highly satisfactory results to himself.

Household Refrigerating Apparatus.

It is within the recollection of men not very old when in all breweries the cooling of the beer or other malt liquors was effected and the temperature maintained by the use of ice, and when the breweries were about the largest consumers of natural ice. Every brewery now has its refrigerating apparatus, the low temperatures required being produced by the expansion of liquid or compressed gas, usually am-

monia. On its return to the so-called "ice machine" the expanded gas is compressed and expanded over again to produce or maintain the required temperature in the beer cellar or cold storage. The use of natural ice for maintaining a given low temperature in a room or compartment of any size has been discontinued entirely.

But in the house we still use artificial ice at great expense and a good deal of inconvenience. The production of practical refrigerating apparatus for domestic use involves a simple and cheap motor and a compressor and circulating system, the whole to work automatically when desired and without more than occasional supervision. It is entirely conceivable that a system may be constructed and assembled that can be controlled thermostatically by the rise and fall of the temperature in a refrigerating chamber.

The whole system must be "fool proof" so that a person of little experience and not more than ordinary sense can operate it.

The problem presents no insurmountable difficulties. The greatest one is to bring it within the means of people in moderate circumstances, which does not look by any means like an impossibility.

The value is perfectly obvious.

Car Fenders.

A number of patents have been granted for different forms of this indispensable safety device for street cars. Practically all street cars must, according to city ordinances, be equipped with fenders of some sort. It is the exception to find a street car in city service not provided with some sort of a fender. No fender of any type now in use can be absolutely relied on to

pick up the person with which it collides. The chances are that it will let the victim under the wheels just as if no protective device were applied to the car. The V-shaped guard which is in some cases carried on the truck underneath the car and rides just in front of the wheels, is far more effective and certain, but is very apt in itself to kill or maim the victim of the accident.

A really effective fender that can be relied on in every case to pick up the person on the track without doing him injury, or that can be relied on to pick him up at all, is yet to be invented. An apparatus not too cumbersome or costly, and absolutely automatic and certain in operation, which would provide a means whereby the car would be brought to a full stop within a distance of not more than five or six feet, upon contact of the fender with any obstruction, human or otherwise, would be highly effective in diminishing street car accidents.

It is suggested to inventors whose interest has been drawn to street car devices that the inventor of a fender that fills the requirements as to safety, certainty of operation and reasonable cost would meet with a great reward. The object, that of preventing serious accidents, may be attained eventually without an automatic braking device. That is only one of several possible methods. In this connection it may be said that traction companies, instead of enlarging their political ownership of cities and towns, are coming more and more under municipal control, and that the present tendency is to force them, whether they like it or not, to adopt better safety appliances and more of them. There is a lot of money in the right thing, not only in this, but in other safety devices for street car use.

Safety Devices.

Another word on safety devices in general, whether adapted to steam railways, street traction systems, manufacturing plants or mines.

As a result of national and State legislation, an awakening public conscience and a growing sense of responsibility on the part of States and municipalities as to their share, through ineffective supervision or total lack of it, in making various occupations more dangerous to health than they need be, as a result also of the better control which the public, through their legislative and executive representatives, are coming to have over the conduct of large industries, especially those operated by corporations, the demand for safety devices and appliances is increasing and will continue to increase, under compulsion applied by national, State and municipal authorities. The time was, and not very long ago, when a safety appliance which involved expense to the owner of a plant or a corporation controlling a railway, traction company, factory or mine was about as hopeless a thing to try to handle, develop or in any way bring to market as existed.

This condition of things has changed rapidly. There is a market for inventions of this kind which have distinct merit, and the market is broadening day by day.

Pneumatic Street Cleaning.

A method or apparatus for street cleaning which will avoid "raising," in other words disseminating, dust, with consequent danger to health, dust particles in the air being a prolific source of infection, is

badly needed. Automobile street cleaning apparatus is already used in some cities. Pneumatic cleaning is successfully used in houses, offices and other interiors, with advantage to the public and profit to a number of inventors and operators. A combination of the two which will carry dust and street refuse to a closed container, where the dust can be slightly dampened, and from which it can be readily dumped, perhaps involving the use of a container readily detached and replaced by another, should, if properly worked out, meet the requirements.

The right thing in this line will find a market.

The Phonograph—Graphophone.

Something has been done already to remove the peculiar metallic "twang" of the delivery in this class of instruments. Much yet remains to be done, as practically every one can testify.

A substantially continuous record in the form of a ribbon, with the recording apparatus adjusted to it, would find a market, if thoroughly worked out in a practical way. A whole opera, symphony or oratorio, or previously selected portions, could be reproduced continuously by such an apparatus.

Rubber Substitutes.

The invention of pneumatic tires, adapted in the first instance to bicycles, completely unbalanced in a year or two the relation between the demand and the supply in the rubber trade. The price of crude ruber went up by leaps and bounds. As the bicycle making industry declined the automobile more than took its place,

creating a new demand greater than existed at the height of the bicycle fever. This increase has continued to the present time at an enormous rate. More or less successful attempts to cultivate the rubber tree have not produced results sufficient to affect the market price in the slightest. This condition makes a strong appeal to inventive genius. It is possible, though unlikely, that a complete substitute for rubber, having all its present valuable qualities, susceptible of vulcanization or some other process which will produce the same effect on the new substance that vulcanization does now upon rubber, and adapted to all the purposes for which rubber is now used, will be invented.

But in a hundred different arts there is a demand for rubber substitutes adapted to special purposes and not necessarily adaptable to others. Celluloid occupies a part of this field, but only a part. Other rubber substitutes for special purposes have been invented, some of which have proved highly profitable. The better part of the field, embracing the broader uses, is still open.

An elastic, resilient substance which will take the place of the pure rubber now used, wholly or in part, in automobile tires, has not yet been produced. The demand for such a substance is almost incalculable, extending well over the civilized world. The same thing is true in other arts where the qualities of elasticity, resiliency and a certain degree of wear-resistance are indispensable.

What has been done in the production of rubber substitutes is a mere beginning compared with what is likely to be accomplished in the next few years. These also will be inventions not difficult to demonstrate, and not costly to develop to a point where they will command capital.

Utilization of Wood Resins.
Camphor as an Illustration.

More or less has been done already in obtaining new and valuable products from pitch, and also from the "lightwood" which remains after the pine tree has been gradually killed by continuous tapping. In the number of products extracted from the pitch or from the wood itself, these may become a source as prolific as coal tar in useful products extracted from them.

Camphor has advanced enormously in price in the last twenty years, and the price is still rising. There has been no increase in the supply as against an enormous increase in demand. The first great rise was due to the perfection of celluloid. A factor that has still farther and in an even greater degree increased the demand has been the use of camphor in the various kinds of smokeless powder. In the latter instance camphor is the only satisfactory solvent so far found for cellulose. It is entirely within the possibilities that a substance may be developed from the sources just indicated that will take the place of camphor for this purpose. It is another case like that of rubber substitutes; the product need have but this one quality of camphor in order to make it of tremendous value.

This is an extremely interesting field for the inventor, holding great possibilities.

Utilization of By-Products.

In some instances this has been carried almost to perfection. It is already an old saying in the pork packing business that it utilizes all of the hog but the squeal. Even

the blood is dried by a special process and used in making ammonia and fertilizers. Mineral wool is made from furnace slag, but in many another industry by-products are still going to waste.

Voting Machines and Devices.

The voting machine, though it has been practically used in a number of municipalities, is not an entire success. Theoretically it should be the best possible method of registering the will of the voter. Theoretically it does its work with even greater secrecy than the Australian ballot system now in general use in the United States. It not only registers the vote but counts it, thereby obviating all possible danger of fraud in the count. Every public man of character hopes to see it a practical success and so does every honest voter, and even every honest politician, however partisan he or they may be. It would be adopted all over the United States if it could stand the severe working tests necessarily applied, operating without sticking, getting out of order, making a false registration or calling on the voter for any exercise of ingenuity or judgment beyond that involved in the simple casting of his ballot. No voting machine hitherto tested has absolutely fulfilled the requirements on all of these points, if the general opinion of the authorities who have tried it in various places is to be taken as decisive. Here is an entirely possible invention that the whole country is waiting for and that will require comparatively little expense to bring to market.

The writer thinks the practical efficiency of the later forms of cash registers, the Burroughs Adding Machine, and the successful demonstrations made of the work

of the Howieson Calculating Machine, which goes farther than the Burroughs in that it is adapted for a good deal of work for which the former is not, indicate that full efficiency will ultimately be attained by the voting machine. This, however, must be the result of inventive ability. All three of the machines above mentioned are key-operated registering machines, never make a false registration, seldom get out of order, and stop if they do.

The necessary improvements in voting machines are certain to come, and the profits will be worth talking about.

Means for Preventing the "Flicker" in Moving Pictures.

This has not so far been accomplished, as millions of patrons of moving picture shows can testify. It may be done by some modification in construction of the shutters now in use, by a new shutter, or by changes which go farther into the construction of the moving picture machine. That this blemish on the work of the machine will be ultimately removed is almost certain. With the wide and growing popularity of the nickel moving picture show, the value of the improvement is almost incalculable. It is stated on good authority that the gross receipts of the moving picture business for 1910 will reach $200,000,000 in this country alone. Some one is likely to get the results that will accrue from this invention. If you are posted, or can post yourself, on the mechanism of the machine, why should it not be you?

Flying Machines.

In these we include the dirigible, "lighter than air" type, in which the car and motor are suspended from a cigar-shaped balloon, as in the Zeppelin, Santos-Dumont and Knabenshue machines, and the "heavier than air" aeroplane. At present each type has its advantages, weaknesses and dangers. The "dirigible" still holds its lead as a weight carrier and can rise to a greater height in the air. The aeroplane is less easily disabled by missiles in its military use, moves easily and rapidly against the wind and is far more easily and effectively controlled. Both badly need safety devices, and the aeroplane needs improvements which will increase its steadiness and carrying capacity. Both types will be improved, by many more inventions, in general efficiency and convenience. Much must, and will, be done by inventors to adapt both machines to practical, everyday use.

Manila "Hemp."

A power machine for cleaning (decorticating) the banana stalk, which contains the well known manila fibre, is urgently needed. Such machines have been invented for sisal, jute, ramie and other useful fibres, but manila is still cleaned by hand labor under the same methods that prevailed a century ago. Cordage fibres for the standing rigging of vessels have been largely replaced by steel, but for running rigging and cables the cordage fibres will always hold their own. Of these manila is by far the strongest, most durable and highest in price. The late J. C. Todd, one of the most distinguished and

successful inventors of cordage machinery in the world, whose machines practically created the sisal industry in the Bahamas, told the writer shortly before his death that such a machine was possible and that he believed he was close to a solution of the problem.

A chemical process might be devised that would do the work, but for the fact that such a process would almost certainly impair the strength of the fibre.

Here is a great staple, in use all over the world, the cost of which can be and eventually will be greatly reduced by invention.

Metallic Railroad Ties.

Inventors have been at work on this problem for nearly thirty years, ever since we woke up to a realization of the fact that our timber supply was not inexhaustible, which we were very slow to do. It can be stated positively that an effective substitute for the wooden tie will be found.

A boy digging for a woodchuck was asked if he expected to get him. His answer was: "*Got* to get 'im; the minister's coming to dinner." We are in exactly that position with regard to the railroad tie. Somebody is going to invent a substitute for the wooden tie that will be practical and cheap. On this point it may be said that a rigid metallic tie will not take up and "smother" the vibration as the wooden tie does. The inevitable result is gradual and progressive loosening at the joints, no matter how tightly they may be bolted, and gradual molecular changes in the metal of the tie itself. All kinds of hollow metallic ties, while supplying some resiliency, are open to the same objection in a somewhat less degree. Concrete and other com-

positions that have been tried have no resiliency whatever and show a tendency to disintegrate under vibration.

But that this problem will be solved, to the great advantage of the railroad companies and the public, and with corresponding profit to some inventor or group of inventors, hardly admits of doubt.

Fouling of Ship's Bottoms.

In the days of wooden ships this was avoided by coppering the bottom of the vessel below the water line, though that did not prevent the accumulation of some barnacles. Applying sheets of copper directly to the bottom of the steel vessel is, of course, entirely out of the question, on account of the electrolytic action which is very soon set up and is destructive to the hull. In some light-draft gunboats built by our Government twenty years ago for use in tropical waters, this difficulty was met by covering the steel hull with a skin of wood and putting the sheet copper over that. Such a method is, of course, impracticable for general purposes.

The bottom of a steel vessel not covered, fouls and "pits" rapidly, especially in tropical waters. No really effective means for preventing this has yet been devised. As things are, a steel vessel, in order to remain in good condition, must go to the dry dock at least four times as often as the old-fashioned copper sheathed wooden ship.

A number of compositions, intended to be applied to steel bottoms in the form of paint, have been devised, and some of them have been patented. The best proof that they are not effective is that none of them have gone into anything like general use.

It may be that the inventor who is successful in this line will have to secure his

results by special treatment of the plates of the vessel, in order to render the surface of the steel non-corrosive and not liable to attack under the conditions which at present cause fouling and "pitting." Or the treatment may have to be given to the steel in the crucible itself, something that is not entirely as chimerical as it may look.

Wave and Tide Motors.

"The ocean old, centuries old;
Strong as youth, and as uncontrolled."

Its strength has hitherto been manifested usually in its destructive activities. It destroys man's work, but has never been harnessed to *do* his work. And yet the power is there, in the rise and fall of its tides and the motion of the waves, power enough to light and heat a continent.

Many experiments have been made in the direction of getting power from the tide or from wave motion. Some of them have been successful enough to confirm previous theories. Even a century ago tide mills were strung all along the New England coast from Cape Cod to the Bay of Fundy. But no one has so far made wave motion of any practical value—has really harnessed the power of the sea.

Electricity is likely to contribute to the ultimate solution of the problem, which solution some time or other is likely to be found. A storage battery exactly adapted for the purpose would undoubtedly be of assistance, as one difficulty in using wave motion to develop power is that it is intermittent and varies greatly in intensity.

Toys, Games and Puzzles.

Inventions in this line which take with the public are always profitable to somebody, either the inventor himself or the man who purchases the invention. Such things will always continue to be produced, and in many cases will pay. In this line of invention it should be borne in mind that the life of nearly all these things is very short. They have their brief season of popularity, followed by practically entire cessation of demand. Three years is a very long time for most novelties that can be classed under any of the three heads. These things call for quick work. If unprotected they are more likely to be misappropriated than are most other inventions.

The inventor who thinks he has a good thing in any of these lines should obtain his patent without delay and get it on the market as promptly as possible. It is better in these cases to accept a moderate royalty per article, or to make any arrangement with the manufacturer that is at all reasonable and at the same time safe, than to delay much in getting the article on the market. But in this class of inventions there is frequently a chance for a large and quick profit.

Devices for the Household, Farm and Office.

It would be difficult to enumerate the possibilities open to the inventor in these lines. There are a great many of them. A really meritorious and useful article that is convenient and cheap; that, for instance, saves labor in the home, effects economies, or obtains better results on the farm, or ministers to convenience, promotes accuracy, or saves time in the office, is always in demand and the limit of invention in these lines will never be reached. An inventor working in any of these directions should be informed, or inform himself, as to what has been accomplished and as to what is needed, which, by the way, is true of practically every line of invention, but is a thing that in these cases is comparatively easy to do.

Perpetual Motion.

Let it alone, no matter what name is given it. It is usually called something else.

(From the New York Times, Sunday, November 22, 1908.)

Moore Hedley Palmer
Edison Nixon Hewitt

The dreams of yesterday are the realizations of today. We live in an age of mechanical, electrical, chemical and psychical wonder. On every hand the human mind is reaching out to solve the problems of earth and sky—the problems of nature. In those solutions are hidden the mysteries and the revelations of all things. While the dreamer may dream, it is the practical man of affairs, with a touch of the imaginative in his nature, who materializes and commercializes new forces and new conceptions. Step by step these men lead in the vanguard of progress. What is their conception of the needs of the world? Toward what is their imagination reaching? What, in their view-point, is the world waiting for—what are the immediate needs of the world in practical, scientific conception and invention?

Here are their answers, based upon accurate knowledge and the skillful artisanship of practical work and conceptive thought. What they reveal is a prophetic look into the future and weighty with significance.

Inventions the World Yet Needs

Edward Bruce Moore, Commissioner of Patents.

In recent years the world has been greatly interested in aerial navigation, and there has been a rapid development of this art. The dirigible balloons of Santos-Dumont, and that of Captain Baldwin recently tested with great success at Fort Myer, Va., show that it is possible, under favorable circumstances, to direct the course of a balloon at will, but this type of airship seems to be, to a great extent, at the mercy of the air currents. Further improvements must be looked for in the "heavier than air" machines, of which the aeroplane of the Wright brothers, successfully tested at Fort Myer and in France, is the best example. The fatal accident which occurred to this machine shows the great need of some form of automatic balancing device which will adjust itself to variations in air currents, and will control the machine under all circumstances without the cooperation of the operator.

The world would welcome a telephone system which would operate successfully beneath the sea, connecting the opposite shores of the great oceans.

The scratching sound produced by the graphophone might be obviated by an invention which would operate without the contact of the stylus with the record.

The gigantic harvests of wheat and corn produced in this country have been successfully handled by the multiplicity of farming implements now in use, but the great cotton fields of the South are still

awaiting a cotton harvester capable of being simply driven through the cotton field and harvesting the cotton without waste. Numerous inventors claim to have produced such a machine, but none as yet has come into general use.

Washington, in common with other cities, has an ordinance prohibiting the production of smoke by boiler furnaces, and while there are many patents having this object in view, the results—judging from the number of prosecutions, followed by assessment of fines—indicate that the capital of the United States and the remainder of the world are still waiting for a smoke preventer.

The breaking of lamp chimneys, incident to the strain of unequal heating, offers a field for the invention of a glass capable of stretching without breaking. Many have sought, as yet in vain, to produce a flexible glass able to stand the same rough usage as sheet metal. The art of making the malleable glass, as known to the ancient Egyptians, has never been revived.

The rapid exhaustion of our timber, especially such as is consumed in the manufacture of wood pulp for paper, makes desirable a cheap and suitable substitute.

A flameless gun, to follow the soundless one recently invented by Mr. Maxim, would render impossible the detection of an enemy. Such a weapon would have a great effect on future tactics.

Safety devices for preventing accidents in mines, on shipboard, and on railways seem to be much needed. Stronger rail fastenings, rail joints, and a substitute for wooden ties must be found if our railways are to handle the constantly increasing weights imposed upon them by the expanding traffic of the country.

So rapidly have our coal fields been worked that in a few years it will be necessary to find some other source of heat. In order to utilize the heat of the sun, now going to waste, attempts have been made to concentrate the rays, by the aid of great systems of mirrors, upon a steam boiler, which would supply steam to an engine. This has been accomplished upon a small scale.

Substitutes for india rubber and leather would find an important place in the arts.

A method of producing electric energy directly from the combustion of fuel has engaged the attention of many inventors, among them Mr. Edison, who, however, has not brought the invention to the point of commercial success.

One of the great items of expense in running an automobile is the rapid wear of and constant injury to the pneumatic tires. Many attempts have been made to produce a satisfactory spring or cushion tire which will outwear, be free from punctures and blow-outs, and possess all the resiliency and other qualities of the pneumatic tire. A storage battery that will render a machine capable of a run of 100 miles is still anxiously sought.

The recent forest fires, which have done incalculable damage and destroyed many lives, cause us to hope for the discovery of some practical method of precipitating rain. The primitive method of back-firing seems to be the only weapon now employed to fight this faithful friend of man when it assumes the guise of an enemy.

The domestic labor problem, always with us, offers untold opportunity for the profitable development of anything that will diminish the labor or the vexation of the housekeeper. Nothing would be more welcome in any household than china that servants could not break. Another boon, not yet discovered, is a non-corrosive composition for drainage pipes.

Thomas A. Edison Interview.

The next era will mark the most wonderful advance in science and invention that the world has ever known or hoped for. So vast will that advance be that we can now have scarcely any conception of its scope, but already a great many of the inventions of the future are assured. It is only of those which I regard as practical certainties that I speak here.

First. Within the next twenty or thirty years—and it will start within the next two or three—concrete architecture will take enormous strides forward; the art of moulding concrete will be reduced to a science of perfection and, what is equally important, of cheapness; there will rise up a large number of gifted architects, and through their efforts cities and towns will spring up in this country beside which Turner's picture of ancient Rome and Carthage will pale into nothingness, and the buildings of the Columbian Exhibition will appear common. But great expense will not attend this; it will be done so that the poor will be able to enjoy houses more beautiful than the rich now aspire to, and the man earning $1.50 a day, with a family to support, will be better housed than the man of today who is earning $10.

Second. Moving picture machines will be so perfected that the characters will not only move, but will speak, and all the accessories and effects of the stage will be faithfully reproduced on the living picture stage. This, of course, will not be done as well as on the regular stage, but its standard will approach very near to that, and the fact that such entertainment will be furnished for 5 cents will draw vast numbers of the working classes. The result will be that the masses will have the

advantage of the moral of good drama; they will find an inexpensive and improving way of spending the evening, and the death knell of the saloon will be sounded.

Third. In perhaps fifteen or twenty years—depending on the financial condition of the country—the locomotive will pass almost altogether out of use, and all our main trunk railways will be operated by electricity.

Fourth. A new fertilizer will spring into existence, containing a large percentage of nitrogen. This will be drawn from the air by electricity, and will be used to increase the arability of the land. Even now this is done to a large extent in Sweden.

Fifth. All our water power will be utilized by electricity to an extent now almost unthought of, and will be used with great advantage, both industrially and for railroads.

Sixth. A successful aerial navigation will be established—perhaps for mails—and will achieve a sound, practical working basis.

Seventh. We shall be able to protect ourselves against environment by the use of serums and things of that sort so that the general state of health will improve and the average span of life will increase by a large percentage. The grand fight which is being made against tuberculosis and cancer will reach a successful culmination, and those diseases will be entirely mastered.

Eighth. A new force in nature, of some sort or other, will be discovered by which many things not now understood will be explained. We unfortunately have only five senses; if we had eight we'd know more.

Ninth. We will realize the possibilities of our coal supplies better, and will learn how to utilize them so that 90 per cent of

the efficiency will not be thrown away, as it is today.

Finally, let it be said, hardly any piece of machinery now manufactured is more than 10 per cent perfect. As the years go on this will be improved upon tremendously; more automatic machinery will be devised, and articles of comfort and luxury will be produced in enormous numbers at such small cost that all classes will be able to enjoy the benefits of them.

These are some of the inventions which the world is awaiting which it is sure of seeing realized. Just how they will be realized is what the inventors are working now to determine.

Frank Hedley.

We're waiting for the ideal in everything—subways along with the rest. The ideal subway for New York would be the minimum distance from the street, both up and down, and would have all the entrance and exit stairs equipped with escalators, or some better means of transporting the public to the cars. Some means would have to be provided whereby the air could be rapidly renewed, and that air would have to be of a purer quality than obtains, not only in the subway of today, but on the streets.

Our ideal subway would have to be equipped with such a car equipment that injury both to passenger and employee would be impossible. In order to accomplish this it would be necessary to invent some means or ways that would absolutely eliminate the infallibility of man.

It would be further necessary to have invented and manufactured electrical and mechanical contrivances which would never get

out of order under any circumstances; also to have an interlocking and signaling machine which would prevent any derailment and prevent any car from taking the wrong track. Incidentally it would be a big thing for some engineer who is striving for a high pinnacle of fame to invent a rail for general use that would not break and would be impervious to climatic changes, causing expansion and contraction—things which have caused the loss of many lives on all railroads.

Briefly, if all these things are ever accomplished, the result will be an ideal system of transportation, better than the world has ever known or the angels in heaven ever hope to ride upon.

A subway thus equipped and operated would necessarily have to be so constructed that it would net at least a fair return on the money invested.

Lewis Nixon.

Inventions in connection with sea-going vessels come just as unexpectedly as on land.

Of course no one expects any revolution in types of vessels or methods of propulsion, as great vessels cost too much to permit other than the most conservative experiments.

The production of steam has, so far as economy in fuel consumption is concerned, reached nearly its limit.

But the very fact of the gradual using up of coal and that the cost of fuel will increase may lead to a more extensive use of the sailing ship, as winds will continue to blow and their energy can not be cornered. But the sailing ship of the future will, I feel sure, be an auxiliary—

that is, have power to drive her in calms and against head winds. The engine for this purpose will almost certainly be the gas engine. The next important step in marine propulsion will be to follow the great success of the gas engine on land and apply it to the propulsion of vessels. This will save in fuel and space occupied, give more room for cargo, and greatly reduce the strain on the machinery operatives.

With the increase in size will come more efficient means for handling freight.

It may be that screw propeller efficiencies will be greatly bettered, and that propellers better fitted to fast revolutions may be developed. In this there is opportunity for radical changes.

Of course, with the improvement in making steel and other alloys the advantages to be gained from the use of stronger sections of less weight will result in a uniform advance, but this is always going on.

Before many years we shall see the absolutely fireproof steamer for carrying passengers.

But it will be with the war vessel that progress will be most spectacular. Heavier guns, heavier shell, more efficient powder, greater perfection in sighting and firing are the results of present development. I expect soon to see the heavy masts, conning towers, and smokestacks disappear. They are all needless, and the future battleship will not have them.

In 1902 I pointed out that it would some day be possible to project electrical impulses with the possible result of shocking to death the men on an enemy's ship or at least of rendering them helpless.

I do not dare prophesy far in the future. All that I have said above are events in the making.

Cortlandt E. Palmer, Mining Expert.

The prevailing scarcity of both common and skilled labor in the precious metal mining districts of this country and of Mexico furnishes a wide field of opportunity for inventors and for those whose originality of method is paramount to invention in mining and ore-milling operations.

The labor situation, which has long been the most vexing problem in the economics of our mining districts, has become, contrary to common impression, quite as serious in the more important camps of Mexico, and in both countries. Superintendents and foremen have long since ceased to examine into a workman's fitness with the old-time care before engaging him. The usual complement of limbs and muscle suffices for the obtaining of employment, regardless of race, experience, or personal record of the applicant. The result of the conditions outlined has been inevitable. A rising scale of wages has gone hand in hand with a falling off in output per unit of labor cost.

In mining and its allied operations, as in other industries, much thought and large sums have been expended in the endeavor to hold the common laborer and the skilled workman to their occupations, but complete success has been attained in rare instances. And in casting about for an explanation one is forced to the conclusion that the development of a mechanical age is largely responsible for the disappearance of the man who has made his livelihood by his muscle or manual skill.

It would seem good judgment to swim with so strong a current rather than against it and endeavor to perfect the substitution of automatic mechanical methods for the manual labor which is becoming

more and more inadequate as to supply and less and less efficient year by year.

For the meeting of the conditions outlined the same policy of development is indicated in mining operations which is serving with cumulative efficiency for the rescue of other industries from the bane of insufficient, inefficient labor. We must do more things mechanically which we now do by hand, and we must do better those many things which are already done mechanically.

As between the entirely new devices required and the improvement of existing devices it would seem that the greater number of opportunities for inventive genius lies along the line of improvements—for the reason that so large a proportion of operations is already performed mechanically in a more or less imperfect way.

As examples of recent important improvements in mine equipment, mechanical drill sharpeners and hammer drills stand out prominently as making for economy in direct costs and labor requirements. But none of these devices is perfected, and the inventor who brings either device a step nearer to what it should be will have his reward.

Timber framing by machinery has been practiced for many years, but a practical, simple machine which will render possible as perfect a joint as can be had by hand work is still to be produced.

An explosive affording practically innocuous products of combustion would go far toward reducing mining risks and operating costs.

There is need for the development of timber preservation plants and methods for use in mine operation, and for conclusive investigation of the practicability of substituting steel or other materials for timber in order to eliminate the constant tax for

repairs in workings which must be kept open indefinitely.

In milling practice there is room for improvement in the mechanical disposal of very fine tailings, where dump room or water supply is limited; perfection is demanded in the design of crushing machinery for the producing of very fine sizes with a minimum of slimes, and the slime concentrator remains an imperfect machine after generations of invention and the introduction of hundreds of devices.

Peter Cooper Hewitt.

What the world is waiting for in the way of light is simply a cheaper light.

Up to the present time light has been chiefly generated by means of the arc and incandescent materials, such as the Edison lamp, the Nernst lamp, etc.; these have very nearly reached their highest point of efficiency. The latest development is the Tungsten lamp, and the greatest efficiency which can be hoped for from it is one watt per candle.

The old lights have all been generated by heating solids, but there is now a new light which is obtained by electric currents passing through vapors or gases of small density. These are called vacuum tubes, and it is to them that we must look for the cheaper—and for most purposes better—lights of the future.

Probably the best known example of this class is the Geister tube, which in the early stages of its development gave forth but little light. Recently, however, this has been worked over and experimented upon with the result that a light has been produced by means of mercury vapor that has an efficiency of one-third of a watt per candle. When it is remembered that the

Edison light costs over three watts per candle, it will be readily seen that already great strides have been made toward reaching the cheap light which the world is awaiting.

Of course, like all other things, the electric light generated by a vapor has its disadvantages for the present. For instance, it does not give off all the wave lengths of light seen in th daylight; each vapor used gives off wave lengths peculiar to itself, so that such light gives to many objects a peculiar appearance. Under it, colors vary and lose their individuality, and at no time can all colors appear as they really are, but by the use of different colored reflectors and the combinations of different lamps, almost any single result desired may be obtained. The future should, however, produce a more perfect light.

But even this seems trifling as compared with the advantages of the vapor light. In the first place, it produces such a light that one can look directly at hundreds of candles of it and then pick up a hair or any other minute object from the floor without the slightest difficulty. It has come nearer to the appearance of daylight than any other sort yet produced—and it is going to come nearer yet; no other light possesses in this regard anything like the possibilities which it has shown. It causes little or no strain, more than ordinary, on the eyes, and one would feel much fresher and better after doing a night's work under it than he would had he used the arc or incandescent light. As was stated, the difficulties which arise from the distorted colors will be overcome, and it is within the range of future possibility that, by means of these color effects, a woman of forty may be made to look like a girl of twenty.

Decidedly the light of the future is the

one generated by vapors. The constant work which is being done upon it is bound to bring it very near perfection, and, coupled with all its advantages, the fact that it can produce light commercially at one-half the smallest cost that the present lights can hope to attain makes its future success assured.

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Messrs. Greeley & McIntire,
Washington, D. C.

Gentlemen :

I beg to extend my thanks to you for your kind interest shown me, relative to a design I have for a Trolley Holder, and, the your report as to the patentability of same was somewhat of a disappointment to me, I certainly appreciate your frankness in advising me right off the reel as to it's merits.

It is a pleasure to deal with a firm which has your interest at heart, and, inasmuch as the design, print of which I sent you, was original with me, I have hopes of being in position at some later date to again call on you for assistance.

Again thanking you very heartily for your prompt attention, beg to remain,

Yours very truly,

5862 Holmes Street.

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TO WHOM IT MAY CONCERN:-

We strongly recommend the firm of Greeley & McIntire, Patent Attorneys, to inventors and those desiring information in patent matters.

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